

particular method of representation, as to point out that the curve of energy of the diffraction spectrum has no special claim to the title of "normal."

RAYLEIGH

THE ORNITHOLOGIST IN SIBERIA¹

THE ornithologists are certainly among the most enterprising of the seekers after truth. John Gould, the Birdman, is dead, but the same spirit which led him over the seas fifty years ago to investigate the then unknown Ornis of Australia still animates his brother birdmen. Mr. Henry Seebohm—a distinguished Member of the British Ornithologists' Union—has recently made two journeys into Northern Siberia, solely with the object of observing new forms and habits of bird-life and of collecting specimens. The scientific results of these expedi-

Vologda. Hence it was rather more than four days and nights continuous sledging to Archangel, which was reached on March 18 at noon. At Archangel, the last civilised city on the route, nineteen days were spent in completing preparations for the further journey and in collecting information of what was considered by the good citizens of that place to be a most formidable undertaking. From Archangel to Ust-Zylma, on the Petchora, a distance of from seven to eight hundred miles lay before the travellers, and as the frost showed some symptoms of breaking up, did not at first promise to be easily got over. Fortunately they were just in time. A fortnight later the thawing snow became impassable, the winter road was destroyed, and the valley of the Petchora became cut off from all communication with civilised Europe for two months! Ust-Zylma, a long, straggling village of wooden houses on the right bank of the Petchora, some 300 miles from its mouth, was the headquarters of the party until June 15. The waiting for the "coming of spring" was rather tedious. Their first week at Ust-Zylma was not very encouraging from an ornithological point of view. After eight days' work, the list of identified birds in the valley of the Petchora only amounted to nine species, mostly of the commonest description. Three weeks had passed, and the thaw still made no progress; the summer seemed as far off as ever. It was sometimes hot in the daytime, but always froze again at night. On April 28 the first bird's-nest was taken (that of the Siberian Jay), but snow-shoes were still required to get about. It was not until May 10, in fact, that any real summer weather came, and it thawed in the shade as well as in the sun; but two days later it actually rained. The migrants then arrived in quick succession: swallows, swans, geese, gulls, wagtails, redstarts, pipits, and shorelarks, all were hurrying up from the south along with the first blush of spring. On May 20, while the party were on a collecting expedition on the opposite bank of the Petchora, which they had crossed as usual on sledges, the grand crash came. The ice which had so long covered the river began to break up with a noise as of rumbling thunder, and cracks ran along it at the rate of a hundred miles in twenty-four hours. It was with great difficulty that the retreat was effected, and a few hours after home was reached the mighty river was in full flood, carrying its burden of pack-ice and ice-floes to the sea at the rate of six miles an hour. In a week's time the Petchora was entirely free from ice, and summer was upon them.

Collecting now began in earnest, and every day added to the number of interesting birds, and increased the variety of nests and eggs. On June 8, 143 eggs were taken and "blown" in the course of the day.

On June 10 the journey down the Petchora was commenced in a large, partly-covered boat hired for the purpose, so that the naturalists might stop when they pleased for the purpose of collecting. The voyage was delightful. Everywhere the Blue-throat, the Redwing, the Brambling, the Fieldfare, the Little Bunting, and the Willow-warbler were common, whilst Three-toed Woodpeckers, Terek Sandpipers, and other rarities were making their nests and laying their eggs for the benefit of the travellers. Here one of the great discoveries of the expedition was made, which cannot be described better than in Mr. Seebohm's own words:—

"We were now a little to the north of the Arctic circle, and at three in the morning moored our boat on the

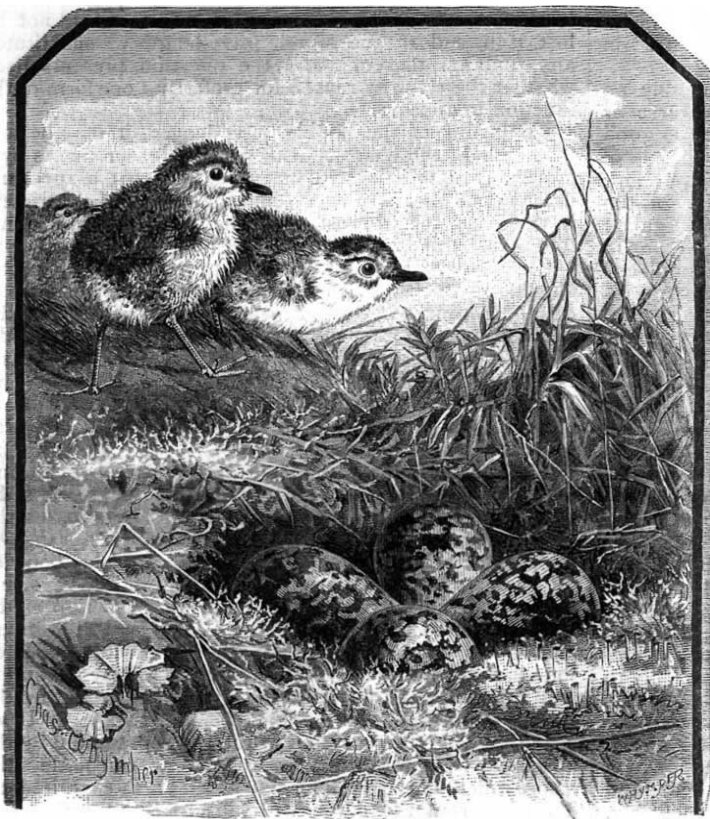


FIG. 1.—Grey Plover's nest and young.

tions have been published in the *Ibis*—the organ of the British Ornithologists' Union—which is now entering upon the twenty-fifth year of its existence, whilst a most interesting and attractive general narrative of the two journeys is given in the volumes now before us.

The first of these two expeditions, to the lower valley of the Petchora, in North-Eastern Russia, was made by the author in 1875, in company with Mr. J. A. Harvie-Brown, a gentleman whose name is also known as that of an excellent field-naturalist. In order to be in time for the early spring migration, London was quitted on March 8, and the railway taken *via* St. Petersburg and Moscow to

¹ "Siberia in Europe: a Visit to the Valley of the Petchora, in North-East Russia; with Descriptions of the Natural History, Migration of Birds, &c." By Henry Seebohm, F.L.S., F.Z.S. 8vo. (London: Murray, 1880.)
"Siberia in Asia: a Visit to the Valley of the Yenisey, in East Siberia; with Descriptions of the Natural History, Migration of Birds, &c." By Henry Seebohm. 8vo. (London: Murray, 1882.)

shores of an island, among whose willows grew an occasional birch or alder. I spent five hours upon it. Sedge-warblers were singing lustily, and sometimes so melodiously that we almost took them to be Blue-throats. Soon, however, my attention was arrested by a song with which I was not familiar. It came from a bird singing high in the air, like a lark. I spent an hour watching it. Once it remained up in the sky nearly half an hour. The first part of the song was like the trill of a Temmick's stint, or like the concluding notes of the Wood-warbler's song. This was succeeded by a low guttural warble resembling that which the Blue-throat sometimes makes. The bird sang while hovering; it afterwards alighted on a tree, and then descended to the ground, still continuing to sing. I shot one, and my companion an hour after shot another. Both birds proved to be males, and quite distinct from any species with which either of us was previously acquainted. The long hind-claw was like that of the Meadow-pipit, and the general character of the bird resembled a large and brilliantly-coloured Tree-pipit. It was very aquatic in its habits, frequenting the most marshy ground amongst the willows.

"On our return home five skins of this bird were submitted to our friend Mr. Dresser, who pronounced it to be of a new species, and described and figured it in a work which he was then publishing on 'The Birds of Europe.' In honour of my having been the first to discover it, he named it after me, *Anthus Seebohmi*. But, alas for the vanity of human wishes! I afterwards discovered that the bird was not new, but had been described some years before from examples obtained on the coast of China. I had subsequently the pleasure of working out its geographical distribution. The honour of having added a new bird to the European list still remains to us, and is one of the discoveries made upon our journey on which we pride ourselves."

Ten days' voyage down the river occupied in this fashion brought the travellers in their boat to Alexievka, the shipping port of the Petchora, where the larch-timber felled on its banks is laden for Cronstadt and other ports. Here their headquarters were fixed until their departure for England on August 1. But the forty days passed here were by no means wasted. The "tundra" on the east bank of the great river, frozen hard and under snow during eight months in the year, becomes in summer a boggy moor covered with carices, mosses, and dwarf shrubs, and varied by abundance of lakes. Untrodden by ordinary man, it was splendid birds'-nesting ground for the ornithologists, who reaped there an abundant harvest. We cannot go separately into the discoveries here made, which are related by Mr. Seebohm in his usual sprightly and energetic style, but they are thus summed up at the conclusion of his volume:—

"Of the half-dozen British birds, the discovery of whose breeding-grounds had baffled the efforts of our ornithologists for so long, we succeeded in bringing home identified eggs of three—the grey plover (Fig. 1), the little stint (Fig. 2), and Bewick's swan. Of the remaining three, two, the sanderling and the knot, were found breeding by Capt. Fielden, in lat. 82°, during the Nares' Arctic expedition, but the breeding-grounds of the curlew sandpiper still remain a mystery. We added several birds to the European list, which had either never been found in Europe before, or only doubtfully so: such as

the Siberian chiff-chaff, the Petchora pipit, the Siberian herring-gull, the Arctic forms of the marsh-tit, and the lesser-spotted woodpecker; the yellow-headed wagtail, and the Asiatic stonechat. We brought home careful records of the dates of arrival of the migratory birds which breed in these northern latitudes, besides numerous observations on the habits of little-known birds.

"Our list of skins brought home exceeded 1000, and the eggs were rather more than 600 in number."

The success of the Petchora expedition induced Mr. Seebohm to wish to extend his field of operations into districts yet further east, when it might be expected that some of the few remaining British birds, of which the breeding-haunts were still unknown, would be found nesting. The remotest eastern corner of Europe having been worked out, it was necessary to push on into Asia, and in 1877 an excellent opportunity of doing this pre-



FIG. 2.—Little Stint's nest, eggs, and young.

sented itself. Capt. Wiggins, of Sunderland, one of the pioneers of the recent attempts to reopen sea-communication with Northern Siberia, had succeeded in penetrating some 1200 miles up the Yenisey (Mr. Seebohm's phonetic spelling of Yenisei) in the previous autumn, and having left his vessel there to winter, and returned home overland, was preparing in February of that year to go back to the Yenisey. At a few days' notice Mr. Seebohm undertook to join him in his journey out, wisely thinking that in such an expedition it was as well to have the company of a gentleman who "knew the ropes," although he might have little sympathy with ornithological pursuits.

Mr. Seebohm and Capt. Wiggins accordingly left London on March 1, and travelled by rail to Nishni Novgorod, a distance of some 2400 miles. Thence was a sledge-journey of about 3200 miles to the winter

quarters of the good ship *Thames*, on the Yenesay, or rather a little way up the Koorayika, an affluent of the Yenesay, on its right bank. The crew of the *Thames*

who had passed a long and dreary winter, frozen up at this spot, were found on the travellers' arrival to be well and hearty, owing to the judicious precautions that had

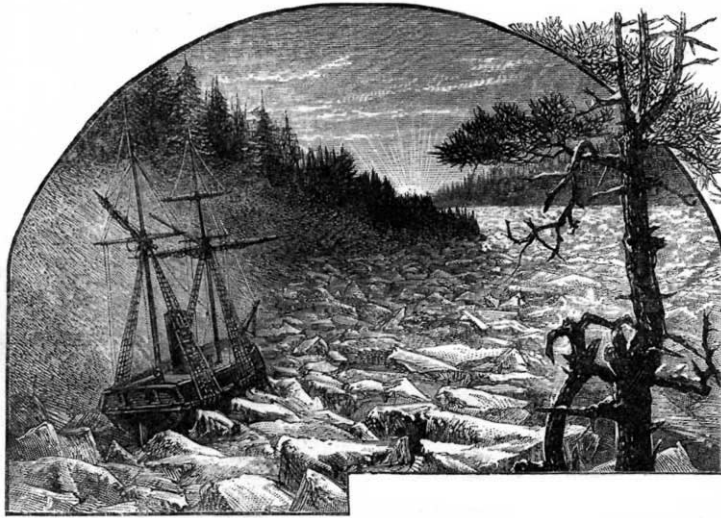


FIG. 3.—Driving with the ice on the Koorayika.

been taken by their Captain for the benefit of their health.

On April 23, when the travellers reached the ship, there were no signs of approaching summer on the Yenesay. On the frozen river the snow lay six feet deep, and was little less in the surrounding forests. Mr. Seebohm put on his snow-shoes and had a round with his gun. Birds were more plentiful than could have been expected. A pair of ravens were generally in sight, and flocks of snow-buntings flitted by. Nutcrackers came to the doors of the sailors' room, to pick up the cook's refuse, and Lapp-tits and Pine-grosbeaks were common in the woods. The excursions into the forest were continued every day, and a few additional birds observed, but on May 1 the list of identified species was only twelve in number, and summer seemed nowise nearer. It was not until May 15 that indications of a thaw appeared, and geese were seen travelling north, but the next day was as cold as ever. After that date, however, some slight progress was made: the water in the Koorayika began to rise, and the summer migrants appeared one by one.

The great battle of the Yenesay, as Mr. Seebohm calls the contest between summer and winter, lasted about a fortnight, during which thousands of acres of ice on the river were hurried up and down as the water rose and fell. Sometimes the floes were jammed so tightly together that it looked as though one might cross the river on them, at other times there was open water interspersed only with stray icebergs. At last the final "march-past" of the ice took place; "winter was vanquished for the year," and succeeded in a few days by "the triumphant music of thousands of song-birds, the waving of green boughs, and the illumination of gay flowers of every hue."

It was not until June 26 that the *Thames* was able to steam away down the river. By this date Mr. Seebohm and his collectors had made large collections of birds and eggs, and having exhausted the novelties of the surrounding district, were heartily glad to be off northwards to fresh fields of research. Unfortunately, after about a week's navigation, the *Thames* grounded on a shoal, and, as the water was falling rapidly, could not, in spite of every effort, be got off again. All that could be done was to move what was necessary into the *Ibis*—a small vessel built on the river—and to continue the voyage down the Yenesay, leaving the *Thames* to her fate.

On nearing the embouchure of the Yenesay, on July 12, a gale compelled the *Ibis* to cast anchor, and advantage was taken of the delay to explore the adjacent "tundra"—



FIG. 4.—Summer quarters on the Koorayika.

"a wild-looking country full of lakes, swamps, and rivers, a dead flat in some places, in others undulating, even hilly—brilliant with wild flowers, swarming with mosquitoes,

and full of birds." Here one of the great discoveries of the second expedition was made, which is described by the author in his usual lively manner:—

"The gale continued next day with rain, until noon, when I took advantage of our enforced delay, and went on shore for a few hours. A climb of about 100 feet brought me on to the tundra. In some places the cliffs were very steep, and were naked mud or clay. In others the slope was more gradual, and covered with willow and alder bushes. In these trees Thrushes were breeding. I soon found the nest of a Dusky Ouzel, with five nearly fledged young. It was placed as before in the fork of a willow, level with the ground. On the top of the bank I found myself on the real Tundra. Not a trace of a pine tree was visible, and the birch trees rarely exceeded twelve inches in height. There was less grass, more moss and lichen, and the ground was covered with patches of yellow mud or clay, in which were a few small stones, that were apparently too barren for even moss or lichen to grow upon. The Tundra was hilly, with lakes, swamps, and bogs in the wide valleys and plains.

"As soon as I reached the flat bogs I heard the plaintive cry of a Plover, and presently caught sight of two birds. The male was very conspicuous, but all my attempts to follow the female with my glass, in order to trace her to the nest, proved ineffectual, she was too nearly the colour of the ground, and the herbage was too high. Feeling convinced that I was within thirty paces of the nest, I shot the male, and commenced a diligent search. The bird proved to be the Asiatic Golden Plover, with gray axillaries, and I determined to devote at least an hour looking for the nest. By a wonderful piece of good fortune I found it, with four eggs, in less than five minutes. It was merely a hollow in the ground upon a piece of turfy land, overgrown with moss and lichen, and was lined with broken stalks of reindeer moss. The eggs resembled more those of the Golden than those of the Grey Plover, but were smaller than either.

"These are the only authenticated eggs of this species known in collections."

Golcheeka, the port at the mouth of the Yenesei, was reached on July 18. As Mr. Seebohm did not think it prudent to attempt the sea-passage home in the little *Ibis*, and the last steamer of the season up the Yenesei was to leave six days afterwards, little could be done in this locality. But excursions were made over the adjoining tundra, where "birds were abundant." "Golden Plovers, Arctic Terns, Ruffs, Red-necked Phalaropes, Snow-buntings, Lapland Buntings, and Dunlins were continually in sight, and the Asiatic Golden Plover was breeding in numbers, though attempts to watch them on to their nests were made in vain." On July 24 Mr. Seebohm finally turned his face homewards, and reached Yeneseisk on August 14, after twenty-two days on the road, which was considered "a good passage." Thence post-horses, steamers, and railways brought him back to Sheffield on October 15, after a journey of some 15,000 miles.

The ornithological results of the second journey were "on the whole satisfactory." It was a great disappointment not to get to the coast, and still more so to miss the birds of the Kara Sea, and to arrive on the tundra too late for most of the eggs specially sought for. This misfortune was caused by the wreck of the *Thames*. But on the other hand "the delay in the pine-forests produced some very interesting results." Besides the eggs of the Asiatic Golden Plover already spoken of, nests and eggs of three species of Willow-warblers, of the Mountain-Accentor, of the Little Bunting, and of the Red-breasted Goose were obtained. All these were previously unknown to western collectors, and were for the most part never previously obtained. Besides this, a large number of other rare birds were found nesting, their eggs and young plumages obtained, and their habits and manners studied

and recorded. Concerning particulars of their discoveries, and for much information on the native tribes of Northern Siberia (a subject to which our author appears to have devoted great attention), as likewise for observations on every other incident coming before the eyes of an intelligent traveller during a journey of 15,000 miles, we must refer our readers to Mr. Seebohm's volumes, which are full of interest not only to ornithologists, but to those who take pleasure in natural history in its widest extent. They may be placed on our shelves next to Bates's "Amazons" and Wallace's "Eastern Archipelago," and form no unworthy companions to the works of those great naturalists.

THE BACILLUS OF TUBERCLE

MR. WATSON CHEYNE'S Report on the Relation of Micro-organisms to Tuberculosis, published in the *Practitioner* for the present month, is one of the fruits of the Association for the Advancement of Medicine by Research, recently constituted for the protection of working physiologists and pathologists. On commission from the Association, Mr. Cheyne visited two of the chief workers on this subject, Toussaint and Koch. He was thus able to see their methods and obtained materials from them with which he has experimented on his return to England.

After some remarks on the method of staining the tubercle bacillus, Mr. Cheyne describes some experiments made with the view of testing the theory that tuberculosis in rodents can be induced by almost any irritant. The result of these experiments, made on a considerable number of animals, was to disprove this theory and to lead to the conclusion that in the former experiments, made before our present knowledge as to the precautions necessary for disinfection of instruments, &c., was gained, the channels for the introduction of specific micro-organisms had been left unguarded.

Experiments were next made to test Toussaint's statement that micrococci can be cultivated from the blood of tuberculous animals, and that the injection of these micrococci into other animals is often followed by tuberculosis. Mr. Cheyne failed to cultivate micrococci from the blood of tuberculous animals; he injected micrococci which M. Toussaint had liberally placed at his disposal, into a considerable number of animals without result, and he found tubercle-bacilli but no micrococci in the organs of several animals which had been injected by Toussaint himself with micrococcal fluid, and had become tuberculous. He therefore concludes that Toussaint's micrococci do not cause tuberculosis, and that an error has crept into his experiments probably because the means used to disinfect his syringes, although amply sufficient to destroy some other kinds of bacilli, did not destroy the tubercle-bacilli.

Cultivations of bacilli were also obtained from Dr. Koch, and the results of their inoculation was in all cases rapid development of tuberculosis. The examination of a large quantity of tuberculous material showed the constant presence of tubercle-bacilli, but of no other micro-organisms. The rapidity and certainty of action of tuberculous material when inoculated into animals was in direct ratio to the number of bacilli introduced, and the most certain and rapid means of inducing tuberculosis in animals is the inoculation of the tubercle-bacillus cultivated on solidified blood-serum. These facts lead Mr. Cheyne to the conclusion that we have before us in these bacilli the virus of the acute tuberculosis caused in animals by the inoculation of tuberculous material.

Pursuing the inquiry from this point, to which it had been brought by the researches of Koch, Mr. Cheyne proceeds to discuss the relation of these bacilli to tuberculous processes in man and to tubercle generally. In all tubercles there are present epithelioid cells, to which,